UNITED STATES PATENT AND TRADEMARK OFFICE

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10/520,028	12/28/2004	Yoichi Nakagawa	MAT-8645US	9202

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 September 2009*.

2a)☒ This action is **FINAL**.   2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-9 and 11-27* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *2,5,8,9,11,12 and 23-27* is/are allowed.

6)☒ Claim(s) *1,3,4,6,7 and 13-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *28 December 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☒ All   b)☐ Some *   c)☐ None of:

      1.☒ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
    Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____ .

DETAILED ACTION

Response to Arguments

1.   Applicants' arguments filed on 09/14/2009 have been fully considered but they are not persuasive.

Applicants' Argument: Applicants argue that the Pautler's selection of the columns of the V matrix is based on a plurality of streams. Paulter, however, is not selecting the transmitting symbols based on each data symbol.

Examiner's Response: Examiner respectfully disagrees. Examiner asserts that Pautler in paragraph 0107 clearly states that each data stream might comprise only one data symbol. Therefore, the selection of the columns of the V matrix can also be based on a plurality of data symbols (i.e. each column of the matrix is associated with a data symbol).

Applicants' Argument: Applicants argue that neither Ketchum nor the combination of Ketchum and Doberstein suggest the features of amended claims 13 and 18.

Examiner's Response: Examiner respectfully disagrees. See the rejection of claims 13 and 18 for more details.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States

only if the international application designated the United States and was published under Article 21(2)
of such treaty in the English language.

2.   Claims 13 is rejected under 35 U.S.C. 102(e) as being anticipated by Ketchum et

al. (hereafter, referred as Ketchum) (US 2003/0185310).

As to claim 13, Ketchum discloses a receiving apparatus (see e.g. Fig. 3, 350) for

receiving data from a transmitting apparatus 310, the receiving apparatus comprising:

an antenna (e.g. 352a) for transmitting a carrier modulation signal including a known

symbol (see paragraphs 0072 and 0080, wherein Ketchum discloses that transmitter

can estimate channel response based on the pilot transmitted by the receiver system on

the uplink) and for receiving a signal from the transmitting apparatus; a propagation

parameter estimation means (see Fig. 5, block 512) for estimating a propagation

parameter from the received signal to generate receiving symbols (see the output of the

decoder 536), the received signal being a signal including a transmitting symbol

generated in the apparatus (see paragraphs 0067 and 0069) by selecting one set of

plural sets transmitting symbol vectors (see paragraphs 0019-0030, especially

paragraph 0030, wherein Ketchum discloses that columns of matrix V(k) are used to

pre-condition symbols before transmission, interpreted as selecting a column for each

symbol) based on each data symbol of transmitting data, the plural sets of transmitting

symbols calculated from the known symbol in the transmitting apparatus (see

paragraphs 0067 and 0069); and a symbol determination means for reconstructing the

transmitting data from the receiving symbols (see Fig. 5, blocks 522, 532, 534, and

536).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3.   Claims 14-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Ketchum, in view of Doberstein et al. (hereafter, referred as Doberstein) (US

6,424,678).

As to claim 14, Ketchum, discloses that the techniques described may be

implemented in various wireless communication systems, including OFDM and CDMA

systems, however, Ketchum does not expressly disclose a carrier separation means for

separating the receiving signal, which is configured by multiple carriers, into a plurality

of sub-carriers, wherein: the propagation parameter estimation estimates a propagation

parameter for each of the sub-carriers and the symbol determination means

reconstructs data from the received signal for each of the sub-carriers. Doberstein, in

the same field of endeavor, discloses a receiver comprising a propagation parameter

estimation means (see Fig. 6, block 618) for estimating a propagation parameter from a

receiving signal (see column 8, lines 27-31); and a symbol determination means (see

block 616) for reconstructing a transmitting data based on the propagation parameter.

Doberstein further discloses a carrier separation means for separating the receiving

signal, which is configured by multiple carriers, into a plurality of sub-carriers (see Fig.

6, blocks 610, 612, and 614), wherein: a propagation parameter estimation means

estimates a propagation parameter for each of the sub-carriers (see block 618 and

claim 5) and the symbol determination means (see block 616) reconstructs a

transmitting data from the receiving signal for each of the sub-carriers. Since Ketchum

discloses that his technique can be implemented in OFDM systems (i.e. a sub-carrier

based system) (see paragraph 0191), it would have been obvious to one of ordinary

skill in the art at the time of invention to modify Ketchum as suggested by Doberstein to

determine the effect of the communication channel for each of the data symbols and

reconstruct the transmitted signals more accurately.

As to claim 15, Ketchum discloses that the sub-carriers are any one of an OFDM

signal that is so configured as to be mutually-orthogonal in a frequency space and a

CDMA signal that is so configured as to be mutually-orthogonal in a code space (see

paragraph 0191).

As to claims 16 and 17, Ketchum further discloses an antenna element 354a

(see Fig. 3), wherein said propagation parameter estimation means (see block 512)

estimates the propagation parameter for that antenna.

As to claim 18, Ketchum discloses a receiving apparatus (see e.g. Fig. 3, 350) for

receiving data from a transmitting apparatus 310, the receiving apparatus comprising:

an antenna (e.g. 352a) for transmitting a carrier modulation signal including a known

symbol (see paragraphs 0072 and 0080, wherein Ketchum discloses that transmitter

can estimate channel response based on the pilot transmitted by the receiver system on

the uplink) and for receiving a signal from the transmitting apparatus; a propagation

parameter estimation means (see Fig. 5, block 512) for estimating a propagation

parameter from the received signal to generate receiving symbol (see the output of the

decoder 536), the received signal being a signal including a transmitting symbol

generated in the apparatus (see paragraphs 0067 and 0069) by selecting one set of

plural sets transmitting symbol vectors (see paragraphs 0019-0030, especially

paragraph 0030, wherein Ketchum discloses that columns of matrix V(k) are used to

pre-condition symbols before transmission, interpreted as selecting a column for each

data symbol) based on each data symbol of transmitting data, the plural sets of

transmitting symbols calculated from the known symbol in the transmitting apparatus

(see paragraphs 0067 and 0069); and a symbol determination means for reconstructing

the transmitting data from the receiving symbol (see Fig. 5, blocks 522, 532, 534, and

536) based on the channel estimation results. Ketchum does not expressly disclose that

the propagation channel estimation means applies orthogonal detection to a received

baseband signal. Ketchum also does not disclose that the received symbol is a complex

symbol. Doberstein in the same field of endeavor, discloses a receiver comprising a

propagation parameter estimation means (see Fig. 6, block 618) for estimating a

propagation parameter from a receiving signal (see column 8, lines 27-31); and a

symbol determination means (see block 616) for reconstructing a transmitting data

based on the propagation parameter. Doberstein further discloses a propagation

parameter estimation means (see block 616) for generating a receiving symbol that is a

complex symbol by applying orthogonal detection (by using a quadrature down-

converter) to a received baseband signal (see column 8, paragraphs 1-3). It would have

been obvious to one of ordinary skill in the art at the time of invention to modify

Ketchum as suggested by Doberstein to fully recover the baseband signal transmitted by the transmitter.

As to claim 19, Doberstein further shows a carrier separation means for separating the baseband signal (see Fig. 6), which is configured by a multiple carriers, into N pieces of sub-carrier elements, where N is an integer of 2 or more, wherein: the propagation parameter estimation means (see Fig. 6, block 618) generates the receiving symbol for each of the sub-carriers after the carrier separation means (see blocks 610, 612, and 614) separates the signal into the sub-carriers. Since Ketchum discloses that his technique can be implemented in OFDM systems (i.e. a sub-carrier based system) (see paragraph 0191), it would have been obvious to one of ordinary skill in the art at the time of invention to modify Ketchum as suggested by Doberstein to determine the effect of the communication channel for each of the data symbols and more accurately reconstruct the transmitted signals.

4.   Claims 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ketchum and Doberstein, further in view of Subramanian.

As to claim 20, Ketchum and Doberstein do not disclose that symbol determination means reconstruct transmitting data after the propagation parameter estimation means applies a reverse spread process to the baseband signal with N pieces of spread codes, wherein N is an integer of 2 or more. Subramanian discloses a communication system comprising a rake demodulator 108, wherein the rake demodulator has been configured to de-spread the received signals with different spreading codes (see Fig. 3 and column 5, lines 45-49). It would have been obvious to

one of ordinary skill in the art at the time of invention to modify Ketchum and

Doberstein, as suggested by Subramanian to take advantage of spread spectrum

techniques in the communication system and recover the received signal accurately.

5.   Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ketchum

and Doberstein, further in view of Bruekers et al. (hereafter, referred as Bruekers) (US

2002/0105907).

      As to claim 21, Ketchum and Doberstein, disclose all the subject matters claimed

in claim 19, except that symbol determination means determines a symbol based on the

receiving power of the antenna. Bruekers discloses a communication system

comprising a bit derivation circuit (interpreted as symbol determination) 17 that converts

the energy level of the bands (it has been interpreted as the received signal power at

the antenna) into a binary value (see paragraph 0055). It would have been obvious to

one of ordinary skill in the art at the time of invention to modify the symbol decision units

disclosed by Ketchum and Doberstein as suggested by Bruekers to perform a robust

verification of data (see paragraph 0006).

6.   Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over

Ketchum, Doberstein, and Subramanian, further in view of Bruekers.

      As to claim 22, Ketchum, Doberstein, and Subramanian disclose all the subject

matters claimed in claim 20, except that symbol determination means determines a

symbol based on the receiving power of the antenna. Bruekers discloses a

communication system comprising a bit derivation circuit (interpreted as symbol

determination) 17 that converts the energy level of the bands (it has been interpreted as

the received signal power at the antenna) into a binary value (see paragraph 0055). It

would have been obvious to one of ordinary skill in the art at the time of invention to

modify the symbol decision units disclosed by Ketchum and Doberstein as suggested

by Bruekers to perform a robust verification of data (see paragraph 0006).

7.   Claims 1, 4, and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable

over Pautler et al. (hereafter, referred as Pautler) (US 2003/0185309), Belotserkovsky

et al. (hereafter, referred as Belotserkovsky) (US 2003/0053571), and further in view of

Huang et al. (hereafter, referred as Huang) (US 6,373,832).

As to claim 1, Pautler discloses a transmitting apparatus for transmitting data to a

radio station (see Fig. 5), the apparatus comprising: an array antenna including M,

pieces of antenna elements (see antennas 102 and 140) for receiving a carrier

modulation signal (see Fig, 3, modulation circuit) of a known symbol (i.e. the pilot

signals, see paragraph 0070) that is transmitting from a radio station and for

transmitting a signal to the radio station, where M is an integer of 2; a propagation

channel estimation means (see block 128) for generating receiving symbols (see

paragraphs 0010-0022) from a baseband signal received at the antenna elements (see

paragraph 0066), wherein the receiving symbols are estimate values for a complex

propagation channel between a transmitting antenna of the radio station and the array

antenna (see paragraphs 0008-0009); a transmitting symbol (V) calculation means (see

block 130) for calculating plural sets of transmitting symbol vectors (see paragraphs

0006, 0017,0091-0095) from the receiving symbols (H) so that each transmitting symbol

vector is configured by plural sets of transmitting symbols (i.e. each element in each

column of matrix V), a symbol mapping means (see paragraph 0071-0072) for

generating transmitting symbols by selecting one set of the transmitting symbol vector

based each data symbol of the (see paragraph 107, wherein Paulter discloses that each

data stream might comprise only one data symbol, and therefore the transmitting

symbol vector is associated with that data symbol) on transmitting data; and transmitting

signals to the radio station through the array antenna (see antenna 140). Paulter does

not expressly disclose saving a plurality of transmitting symbols in a reference table.

However, it would have been extremely well known in the art at the time of invention to

modify Paulter and save the results of transmitting symbol calculation for instance in a

table for further processing. Paulter discloses all the subject matters claimed in claim 1,

except for a reference symbol generation means for generating a reference symbol that

gives a phase reference and is the same symbol with the known symbol for determining

channel estimations; a carrier modulation means for generating baseband signals from

the transmitting symbols; and a transmitting means for converting baseband signals to

radio frequency signals to transmit the radio frequency signals to the radio station

through the array antenna. Belotserkovsky shows a communication system, comprising

a channel estimator 50 (see Fig. 2). Belotserkovsky further shows a reference training

symbol storage 58, which has been coupled to channel estimator 50 to provide the

reference training symbol thereto. It would have been obvious to one of ordinary skill in

the art at the time of invention to modify Pautler as suggested by Belotserkovsky to

determine a more accurate channel estimate. Pautler and Belotserkovsky disclose all

the subject matters claimed in claim 1, except for a carrier modulation means for

generating baseband signals from the transmitting symbols; and a transmitting means

for converting baseband signals to radio frequency signals to transmit the radio

frequency signals to the radio station through the array antenna. Huang, in the same

field of endeavor, discloses a CDMA transceiver system comprising a feedback path 34

(see Fig. 1A and the abstract). Huang further discloses that before sending any

information (i.e. the transmitting symbols) to the transmitter through the feedback path,

this information needs to be modulated (see modulator 37). Huang does not expressly

discloses that the output of modulator 37 has been up-converted to radio frequency

from baseband, however, it is extremely well known in the art that the system needs to

convert the baseband signals to RF to facilitate data transmission over radio

communication channels. Huang also does not expressly disclose that modulation is

carrier (i.e. single carrier) modulation, however Huang's system is a CDMA

communication system and CDMA is an example of single carrier modulation technique.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of

invention to perform single carrier modulation in the system disclosed by Huang to

transfer the signal according to CDMA standard. It would have been obvious to one of

ordinary skill in the art at the time of invention to modify Pautler and Belotserkovsky as

suggested by Huang to facilitate data transmission in the feedback channel.

As to claim 4, none of the references above expressly disclose that antenna

elements configuring said array antenna have a mutually different directional pattern or

mutually different polarization. However, setting the directional pattern of the antenna is

a matter of design choice and it would have been obvious to one of ordinary skill in the

art at the time of invention to modify Pautler, Belotserkovsky, and Huang to use antennas with different directional patterns to meet the design requirements of the system.

As to claim 7, Pautler discloses a transmitting symbol calculation means (see Fig. 5, block 130) calculates the plural sets of transmitting symbol vectors from the M pieces of receiving symbols so that the each transmitting symbol vector is configured by M pieces of transmitting symbols (see paragraphs 0006, 0017-0021), the symbol mapping means generates M pieces of transmitting symbols by selecting one set of transmitting symbol vector based on transmitting data (see paragraphs 0071-0072). Pautler and Belotserkovsky disclose all the subject matters claimed in claim 1, except for a carrier modulation means for generating baseband signals from the transmitting symbols. Huang, in the same field of endeavor, discloses a CDMA transceiver system comprising a feedback path 34 (see Fig. 1A and the abstract). Huang further discloses that before sending any information (i.e. the transmitting symbols) to the transmitter through the feedback path, this information needs to be modulated (see modulator 37). Huang does not expressly disclose that modulation is carrier (i.e. single carrier) modulation, however Huang's system is a CDMA communication system and CDMA is an example of single carrier modulation technique Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to perform carrier modulation on the signals received from M antennas to transfer the signal according to the CDMA standard.

8.   Claims 3 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Pautler, Belotserkovsky, and Huang, further in view of Wallace et al. (hereafter, referred

as Wallace) (US 2002/0193146).

As to claim 3, Pautler, Belotserkovsky, and Huang disclose all the subject

matters claimed in claim 1, except that the transceiver applies a reverse spread

separation process to the baseband signal received at the M pieces of antenna

elements with N pieces of spread codes, and generates "M x N" pieces of receiving

symbols. Wallace discloses a wireless communication system (see Fig. 10 A), wherein

plurality of antennas at the transmitter (see antennas 208 and 210) transmit signal to an

antenna array at the receiver (see antennas 214 and 216). Wallace further shows (see

Fig. 10B) that at the receiver, a plurality of mixers apply a reverse spread separation

process to the baseband signal received at the M pieces of antenna elements with N

pieces of spread codes, and generate "M x N" pieces of receiving symbols. It would

have been obvious to one of ordinary skill in the art at the time of invention to modify

Pautler to use different spreading codes for each antenna to maintain the orthogonality

between the received symbols and reduce the interference on the received signal.

As to claim 6, none of the references above expressly disclose that antenna

elements configuring said array antenna have a mutually different directional pattern or

mutually different polarization. However, setting the directional pattern of the antenna is

a matter of design choice and it would have been obvious to one of ordinary skill in the

art at the time of invention to modify Pautler, Belotserkovsky, Huang, and Wallace to

use antennas with different directional patterns to meet the design requirements of the

system.

Allowable Subject Matter

9.   Claims 2, 5, 8, 9, 11, 12, and 23-27 allowed.

Conclusion

10.   Applicant's amendment necessitated the new ground(s) of rejection presented in

this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37

CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE

MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later

than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Leila Malek whose telephone number is 571-272-8731.

The examiner can normally be reached on 9AM-5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Mohammad Ghayour can be reached on 571-272-3021. The fax phone

number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Leila Malek
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